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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/634,912	08/09/2000	Naomasa Shimojoh	1344.1043/JDH	5324

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EXAMINER

CUNNINGHAM, STEPHEN C

ART UNIT	PAPER NUMBER
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3663

DATE MAILED: 09/25/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/634,912

Applicant(s)

SHIMOJOH ET AL.

Examiner

Stephen C. Cunningham

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 June 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12, 14 and 18-35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12, 14 and 18-35 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claim 1 and 18-32 are rejected under 35 U.S.C. 102(b) as being anticipated by Kidorf et al.

With respect to claim 1, Kidorf et al. teach an optical amplifier comprising:
optical amplifying means amplifying a WDM signal using a rare earth doped fiber;

excitation light used has a wavelength capable of producing Raman amplification with respect to optical signals of said second wavelength band; and
amplifying means supplying excitation light which has Raman amplifying capable in the second wavelength band light to a Raman medium on a pre-stage side.

See figure 6, and column 4, lines 18-25, wherein pump light from pump source 673 pumps EDF 654 and is then supplied to fiber 634 on the pre-stage side of EDF 654 and therein produces Raman gain to signal light. The first and second wavelength bands are any arbitrary sub-bands in the amplification range comprising more than 2 wavelengths in each band.

With respect to claim 18, Kidorf et al. teach an optical amplifier comprising:

optical amplifying unit amplifying a WDM signal using a rare earth doped fiber;

excitation light used has a wavelength capable of producing Raman amplification with respect to optical signals of said second wavelength band; and
amplifying unit supplying excitation light which has Raman amplifying capable in the second wavelength band light to a Raman medium on a pre-stage side.

See figure 6, and column 4, lines 18-25, wherein pump light from pump source 673 pumps EDF 654 and is then supplied to fiber 634 on the pre-stage side of EDF 654 and therein produces Raman gain to signal light. The first and second wavelength bands are any arbitrary sub-bands in the amplification range.

Claims 19-32 are understood to stand or fall with claim 18 because claims 19-30, dependent on claim 18, receive no independent argument for patentability and claims 31 and 32 are argued as having similar features as claim 18.

2. Claims 33-35 are rejected under 35 U.S.C. 102(b) as being anticipated by Ma et al.

With respect to claim 33, Ma et al teach an amplifier comprising:

an optical amplifier, amplifying wavelength division multiplexed signal light which has a first and a second wavelength band, wherein,

said optical amplifier provides Raman amplification to optical signals of a second wavelength band on a pre-stage side. See figure 4, and column 2 line 30 through column 3, line 3.

With respect to claim 34, Ma et al teach an amplifier comprising:

a demultiplexer providing first and second band outputs;

an amplifying unit that amplifies the second band; and

a multiplexer that combines the first and the second band.

With respect to claim 35, Ma teaches an apparatus comprising:

an optical amplifier selectively amplifying the second wavelength band such that the spectral output is flat.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kidorf et al. in view of Ma et al.

Kidorf et al. teach that Raman amplification for the conventional band requires a pump wavelength of 1450, and an EDF is pumped at 1480. Ma et al. teach demultiplexing means demultiplexing said WDM signal light into respective optical signals of a first and second wavelength band;

optical amplifying means having a first section for amplifying optical signals of the first wavelength band, and a second wavelength band amplifying

optical signal of the second wavelength band. It would have been obvious to modify the apparatus of Kidorf et al. by substituting the split band apparatus of Ma et al. for the EDF 654 in Kidorf et al. so that pump light from at least one of the split band EDFAs (with pump light of 1480 nm) is supplied to Raman medium 634 (to produce Raman amplification in the long band) in the apparatus of Kidorf et al. in order to produce a wideband gain-flattened amplifier with efficient use of pump power.

4. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kidorf et al. in view of Ma et al. as applied to claim 2 above, and further in view of Sun et al. '11/97.

Sun et al. teach a split band amplifier wherein the first wavelength band is a 1550 nm band and the second wavelength band is a 1580 nm band wherein a 1480nm pump source is used to pump the first optical amplifying section.

With respect to claim 4, Kidorf et al. teach that EDFs are pumped with 1480nm light, for 1550nm signals Raman amplifiers are pumped at 1450, coupler supplying excitation light to an EDF from the rear side, and supplying excitation light from an EDF to a Raman amplification producing medium. It would have been obvious to supply 1480nm excitation light to the EDF and then to the Raman gain medium because pumping at 1480 produces high power amplification in EDF and produced Raman gain in the 1580nm band which has a

much smaller gain/length of fiber than the 1550nm band, thereby producing a flat gain amplifier with efficient use of pump light.

5. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kidorf et al. in view of Mitsuda et al.

Kidorf et al. teach amplifying means supplying part of said excitation light used in a amplifying section to a Raman producing medium. Mitsuda et al. teach, in figure 1, demultiplexing means demultiplexing the WDM signal into respective first and second bands, a preamplifier for amplifying both the first signal 51 and second signal 53 and a second erbium doped fiber amplifier 33 for amplifying only the second signal 53. It would have been obvious to further modify Kidorf et al. by substituting a first stage amplifying section leading to demultiplexing means leading to a second stage amplifying means for amplifying only the second wavelength band in order to provide high gain while limiting the active components needed for flattened gain amplification and to then multiplex the first and second signals so they may travel on the same transmission line.

6. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kidorf et al. in view of Mitsuda et al. as applied to claim 5 above, and further in view of Sun et al. '11/97.

With respect to claim 6, Sun et al. teach an amplifier wherein the first wavelength band is a 1550 nm band and the second wavelength band is a 1580 nm band wherein a 1480nm excitation light in the first optical amplifying section.

With respect to claim 7, Kidorf et al. teach an optical amplifier comprising an erbium doped fiber, at least one excitation light source, and an optical coupler for supplying excitation light to said erbium doped fiber from a rear side, wherein a part of said excitation light is passed through said erbium doped fiber and supplied to said Raman amplification producing medium. Mitsuda et al. teach that the excitation light is 1480 nm. It would have been obvious to modify the apparatus by supplying an excitation light of 1480 nm in order to provide efficient amplification in erbium doped fiber.

7. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kidorf et al.

Official Notice is taken that optical fiber with a small cross section increases Raman amplification. It would have been obvious to use a fiber with a small nonlinear cross section compared to a 1.3 zero dispersion single mode fiber in order to increase Raman amplification.

8. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kidorf et al. in view of Antos et al.

Antos et al. teach the use of dispersion compensating fiber. It would have been obvious to modify Kidorf et al. to include dispersion compensating fiber to compensate for chromatic dispersion.

9. Claim 10, 11, and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kidorf et al. as applied to claim 1 above, and further in view of Kosaka et al.

With respect to claim 10, Kidorf et al. fail to teach the use of control means. Kosaka teaches the use of power constant control means. It would have been obvious to further modify Kidorf et al. to add power constant control means to an optical amplifier to prevent power transients.

With respect to claim 11, Kosaka teaches the use of gain constant control means. It would have been obvious to add gain constant control means to an optical amplifier to prevent gain ripple due to fluctuations in the gain spectrum.

With respect to claim 12, Kosaka teaches the use of supervisory control means for processing a supervisory control (probe) signal transmitted together with the wavelength division multiplexed signal light. It would have been obvious to add supervisory control means to an optical amplifier to monitor the system.

10. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kidorf et al. in view of Mitsuda et al. as applied to claim 5 above, and further in view of Kosaka.

Kidorf et al. and Mitsuda et al. fail to teach the use of power monitor means and the use of power control means. Kosaka teaches the use of power monitor means and the use of power constant control means. It would have been obvious to further modify Mitsuda add power monitor means and power

constant control means to an optical amplifier. Kosaka teaches the use of control means for correcting the difference between the output signals of different wavelengths.

Response to Arguments

The applicant has amended the claims to recite that the first wavelength band contains a plurality of optical signals with several wavelengths different from each other and a second band containing plural signals with several wavelengths different from the wavelengths of the first band. It is noted that as long as each of the first and second band has several wavelengths and several of the second band wavelengths do not overlap with the first band the conditions of the claim are met. An arbitrary choice for a first and second wavelength bands could be made according to gain in the amplifier being predominantly Raman or erbium gain as depicted in Figure 2a of Kawai et al, however there is no limitation governing how the first and second bands are differentiated between.

The applicant argues that Kidorf fails to teach an amplifier which amplifies in a first band (of, e.g., a C band) and a second band (of, e.g., a L band). The argument implies that the first wavelength band must be in the C band and the second band in the L band. This is not in the claim.

Because there is no limitation governing the wavelengths contained in the first and second wavelength bands the first wavelength band may be arbitrarily

chosen to be any first set of adjacent wavelengths and the second wavelength band may be chosen to be any second set of adjacent wavelengths.

Also the Kawai reference presents evidence that when pumped at 1505 nm (this is in the range taught by Kidorf) the Raman gain spectrum is shifted to a longer wavelength band (of, e.g., a I band.)

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Kawai;

Masuda et al 'ECOC '97;

Masuda et al 'Elec. Letts. '1997;

Masuda et al 'ECOC '98;

Masuda et al 'Elec. Letts. '1999;

Masusa.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the

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shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen C. Cunningham whose telephone number is 703-605-4275. The examiner can normally be reached on Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas Tarcza can be reached on 703-306-4171. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-7687 for regular communications and 703-305-7687 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-306-4180.

September 23, 2002


THOMAS H. TARCZA
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